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Limnological Survey of Tighra Reservoir, Gwalior M.P (India)

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Abstract
The present paper deal study of Physico- chemical parameter in water of Tighra reservoir of Gwalior (M.P) the water of Tighra reservoir is life line of Gwalior city. Water is more useful of animal and plant as well as provided natural habitat of them. The biota of surface water is governed by various environmental Condition. The water of this reservoir is used for fish culture, irrigation, in industries, domestic and drinking purpose. The present study was carried out one year from January -2023 to December -2023. During investigation period physico-chemical parameter of water in Tighra reservoir like temperature, Ph, Transparency, Turbidity, sodium (Na+), potassium(k+), alkalinity, TDS, chloride , Conductivity, CO_2, Dissolved Oxygen, Total Hardness, Hardness Ca, Hardness Mg, BOD, COD, Nitrate, Chloride, were analysed. Most of the physico-chemical parameter are under permissible limit of NEERI. Keyword:- Tighra, Physico- chemical Parameter, water, Reservoir.

Keyword: Tighra, Physico-, water, Reservoir, chemical Parameter

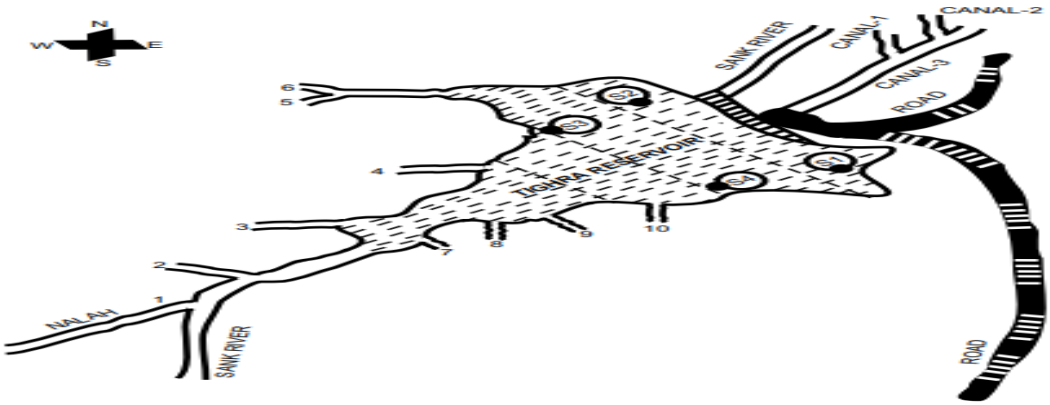
Introduction

Water is an essential requirement for life and has been put to diverse uses including human and domestic consumption, irrigation, industry, and aquaculture and is also a basic requirement for sustaining a high quality of life for economic and social development. It forms the liquid constituent of all living matter and is used by both the animals and plants for their metabolic activities. The surface water and groundwater resources of the country play a major role in agriculture, hydropower generation, livestock production, industrial activities, forestry, fisheries, navigation, recreational purpose etc. The demand of freshwater has increased many folds and at the same time sewage, industrial wastes, agriculture runoff, varieties of synthetic chemicals and other anthropogenic activities degrade the quality of large share of this limited quantity of water. The water characteristics of any water body depend manly on geographical location, climate, seasons, topography and demographic pressure. The reservoirs located near the cities and towns receive a good amount of sewage load altering their physico-chemical characteristics. In Madhya Pradesh, there are many freshwater bodies in the form of rivers, lakes, and man-made reservoir in the state. The small, medium and large reservoirs in this state are estimated to be 1,73,901ha. The average size of these small, medium, and large reservoir is 3,50,2527 ha respectively, contributed to the maximum water spread of all Indian states under man-made lakes. Gwalior and Chambal divisions are rich in water resources and have approximately 54,839 ha water falling under reservoirs. The physico-chemical characteristics and play an important role in assessment of the water quality and tropic status of a water body. However, information on the ecology especially the tropic status of the reservoirs is scanty. Only a few workers have

attempted to study some of reservoirs for their nutrient's status. Therefore, this paper aims at the study of nutrients characteristics and tropic status of Tighra reservoir along with its suitability as habitat for aquatic organism. The Gwalior's city water demand is mainly dependent on the primary source Tighra reservoir on the sank river situated about 20km south west of the city. This dam has been constructed in the vicinity of eleven villages. The villagers depend on this dam for their irrigation, drinking and domestic purpose. Gwalior, an ancient city known for the great musician Tansen, is situated in the north region of Madhya Pradesh. The city is gifted with a number of historical place and tourist places. Tighra reservoir is the major source of drinking water to Gwalior city. Besides, the water of Tighra reservoir is also used for irrigation and pisciculture. Tighra village which is in close proximity of SADA Magnet city. It lies on 26˚ 13' N latitude and 78˚ 30' E longitude at an altitude of 218.58m. The reservoir is surrounded by hills from three sides. The construction of the reservoir was started in the year 1910 across a seasonal rain fed sank river primarily to fulfil the water supply of the city. The reservoir is irregular in shape having shallow embayment at its periphery. The maximum depth of the reservoir is 130.80 km (4600mcft). The dead storage capacity of the reservoir is 232 mcft and the live storage capacity is 4390 M.

Study Area:

The Tighra Fresh Water Reservoir is located at latitude 26-12'0" and longitude 78-30-O" E. At an elevation of 218.58 meters, it is situated close to Saga Magnet City, about 20 kilometers west of Gwalior City, MP. The name Tighra Fresh Water Reservoirs comes from the fact that it was built on a sunk river and is encircled by three hills. The late Maharaja Madhava Rao Sindhiya rebuilt what was once known as Madhav Jalashay in 1910. On the southwestern extremity of the reservoir, a gorge allows the Sank River to enter. About a dozen little nallahas drain into the reservoir from the hillside. The concrete masonry wall is located northeast of the reservoir. The reservoir's form is asymmetrical, with numerous shallow embayments surrounding it. The reservoir's maximum width is 3.8 km, and its maximum length along the south-west-northeast axis is 5.8 km. The reservoir has a gross storage capacity of 130.80 m (4622 m cft) and a maximum depth of 18 m. With a live storage capacity of 124.23 m (4390 m cft), the Tighra reservoir has a dead storage capacity of 6.56 M (232 m cft) below the lowest still level (L.S.L.).The MP Fisheries Department also uses the reservoir as a stocking pond. Materials and Methods: The reservoir was separated into four zones for the purpose of analyzing its physico-chemical parameters. As shown in the picture as S1, S2, S3, and S4, one sampling station was chosen for each zone. The sample stations were chosen to cover as much of the reservoir as possible. The monthly subsurface water samples are taken on a regular basis during the second week of the month at 9:00 a.m. While other factors were determined in the lab, pH, temperature, and transparency were estimated on the spot.



Materials and Methods

The reservoir was separated into five zones for the purpose of analyzing its physico-chemical parameters. As shown in the picture as S1, S2, S3, and S4. one sample station was chosen for each zone. The sample stations were chosen to cover as much of the reservoir as possible. The monthly subsurface water samples are taken on a regular basis during the second week of the month at 8:00 a.m. While other factors were determined in the lab, temperature, pH, and transparency were estimated on the scene.

Method we used:

Method as describes in standard book for examination of water and waste water (APHA 1985 and Trivedi & Goel 1986) were used for the physico-chemical analysis. The physico-chemical parameters viz., transparency was determined by Secchi disc, electric conductivity by conductivity meter , total dissolved solids by digital (TDS) meter, pH by pH meter, free carbon dioxide by laboratory method (Goyal and Trivedi), sodium and potassium by flame photometer, DO (dissolve oxygen) by wrinkle's method , Nitrate by Brucine method, Water temperature and ambient temperature by the mercury filled thermometer. Turbidity by the Nephelometric turbidity meter, total Alkanity, total Hardness It was calculated by the method of ammonia buffer and EDTA, calcium hardness by EDTA titrimetric method, magnesium hardness by calculation method, chloride by Mohr's Method. Result and Discussion The effects of monthly variation in physico-chemical parameters of fresh water from Tighra reservoir is given in table, and a pair of monthly variation of a physico-chemical parameters of fresh water is given in table and pie chart.

Result and Discussion:

Temperature: is a significant element that influences the biological activity of organisms in bodies of water. It was discovered that the air and water temperatures were rather different. The majority of the water bodies on the Indian subcontinent have temperatures between 7.8°C and 38.5°C (Goel et al., 1980). The Tighra reservoir's water temperature ranged from 15 to 31.1°C. Aside from that, it was lower than the atmospheric temperature. in the winter. october was the month with the highest recorded water temperature, and January 2023 was the month with the lowest.

Conductivity: The ability of a material or solution to carry electrical current is measured by its conductivity. It was discovered that the sp. conductivity varied from 128 to 623 (mS/cm). December was the month with the lowest value, and July 2023 was the month with the highest value.

Ph: There was no discernible variation in the total pH levels across the four stations. The pH readings ranged from 7.2 to 7.74 . The month of February had the highest pH value, while the month of July 2023 had the lowest. At every location, the pH was discovered to be alkaline.

Turbidity: The range of the turbidity readings was 1.4 to 3 NTU. The highest reported readings were 3 in January, while the lowest was 1.4 NTU in July 2023.

Dissolved Oxygen: One of the crucial parameters in evaluating the quality of water is DO, which represents the biological and physical processes that are present in the water. DO is typically present in non-polluted surface water. The DO levels ranged from 7 to 8.7 mg/l. The month of February saw the highest DO values, while the month of November 2023 saw the lowest.

BOD: The Tighra reservoir's BOD value varied from 1.1 to 1.8 mg/l. The month of August had the highest BOD value, while the month of January 2023 recorded the lowest.

COD: The quantity of oxygen needed to chemically oxidize both organic and inorganic molecules is measured by the Chemical Oxygen Demand (COD). The COD showed considerable diversity, ranging from 11.52 mg/l to 56 mg/l. Increased organic and inorganic pollution is indicated by higher values, especially near the conclusion**.**

Total dissolved solid: In the Tighra reservoir, the TDS value varied from 110 to 401 mg/l. In November, the TDS value reached its highest 401, while in March, it was at its lowest of 110.

Alkalinity: The water's buffering capacity is shown by its total alkalinity, which quantifies its ability to neutralize acids. The range of total alkalinity was 55 mg/l to 230 mg/l, with greater values in the middle and at the end, signifying times when the water's buffering ability was higher.

Sodium: One mineral that can affect the flavor and chemical properties of water is sodium. The range of sodium was 5.0–10.4 mg/l. The higher numbers indicate times with higher sodium content, especially near the conclusion.

Potassium: For aquatic plants and creatures, potassium is a necessary nutrient. With minor changes in certain values, potassium levels between 0.8 and 1.31 mg/l show a comparatively constant presence of potassium.

Chloride: Chloride levels ranged from 36 to 83.5 mg/l. The months of November and June 2023 saw the highest and lowest levels of chloride, respectively.

Total Hardness: The amount of calcium and magnesium ions in the water is gauged by its total hardness. The range of total hardness values was 49 to 452mg/l. A notable concentration of calcium and magnesium ions at that moment is indicated by the high measurement of 452 mg/l.

Calcium hardness: Being a crucial component of cell walls and a regulator of several physiological processes in animals, calcium is vital to all living things. The range of the calcium measurement was 40 mg/l to 400 mg/l. Calcium levels ranged from a minimum of 40 mg/l in January 2023 to a maximum of 400 mg/l in November 2023. The amount of calcium was discovered.reduced during the monsoon season and climbed during the winter

Magnesium hardness: A measure of magnesium ion concentration, magnesium hardness is a part of overall hardness. Higher values indicated different amounts of magnesium ions. Magnesium hardness values ranged from 10 mg/l to 62 mg/l.

Nitrates: The Tighra reservoir's nitrate levels varied from 0.4 to 1.2 mg/l. In April , the nitrate value was at its highest, 1.2 mg/l, while in December , it was at its lowest, 0.4 mg/l. With the exception of the monsoon and summer, the water nitrate value was extremely low for the majority of the year.

Conclusion: Although all of the freshwater reservoir's metrics fell within the acceptable ranges specified by the WHO, ISI, and IS, the variations in the values were examined seasonally. A few indices increased during the rainy season, which had an impact on the reservoir's physico-chemical characteristics. The reservoir's water is used for fish culture and is below the allowable level. industrial, residential, agricultural, and beverage uses.

TABLE: Monthly Variation of Physico-Chemical Parameter

parameters	Unit	JANUARY (2023) TO DECEMBER (2024) MONTH											
		Jan -23	Feb -23	Mar -23	Apr -23	May -23	June -23	July -24	Aug - 24	Sep -24	Oct -24	Nov -24	Dec -24
Temperature	ºC	15	19	22	23	25	27	24	20	22	31.1	18	18.2
Conductivity	µS/cm	176	244	176	196	200	440	623	208	205	130	620	128
pH	mg/l	7.64	7.74	7.66	7.56	7.40	7.46	7.2	7.64	7.61	7.71	7.25	7.67
Turbidity	NTU	3	2	3	2	3	2	1.4	3	2	1.2	2	3
Dissolved Oxygen	mg/l	8.5	8.7	8.5	8.3	8.6	7.6	7.1	8.1	8.2	7.2	7	8.1
BOD	mg/l	1.1	1.4	1.6	1.3	1.5	1.7	1.4	1.7	1.6	1.6	1.6	1.5
COD	mg/l	15	18	17	19	23	26	11.52	18	17	43	56	14
TDS	mg/l	110	156	110	114	190	284	400	130	125	84	400	80
Total Alkanity	mg/l	70	90	140	155	168	170	230	110	105	66	220	55
Sodium	mg/l	8.5	9.2	9.5	9.7	10	10.4	14	7.5	7.45	5	10	6.7
Potassium	mg/l	0.8	1	1.1	0.9	1.17	1.2	1.31	0.9	0.8	1	1.23	1.1
Chloride	mg/l	61	65	68	47	50	36	83.5	70	65	54.9	77	40
Total Hardness	mg/l	65	80	168	232	188	150	432	105	100	50	458	50
Hardness Ca	mg/l	40	50	128	135	100	110	370	70	70	40	400	40
Hardness Mg	mg/l	25	30	40	35	41	40	62	35	30	10	58	10
Nitrate	mg/l	0.7	0.6	1.1	1.2	1	0.6	0.86	1.1	1.2	0.4	1	1.1

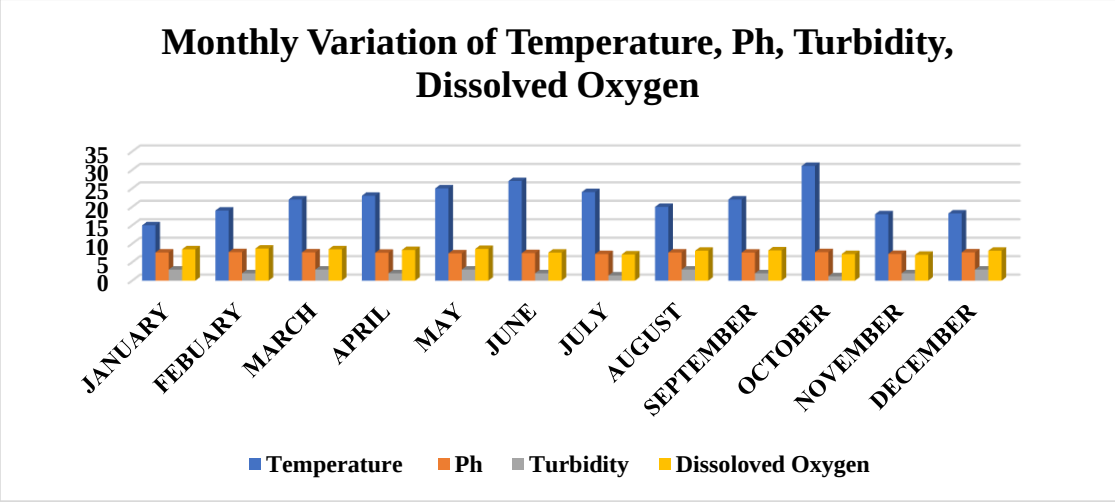
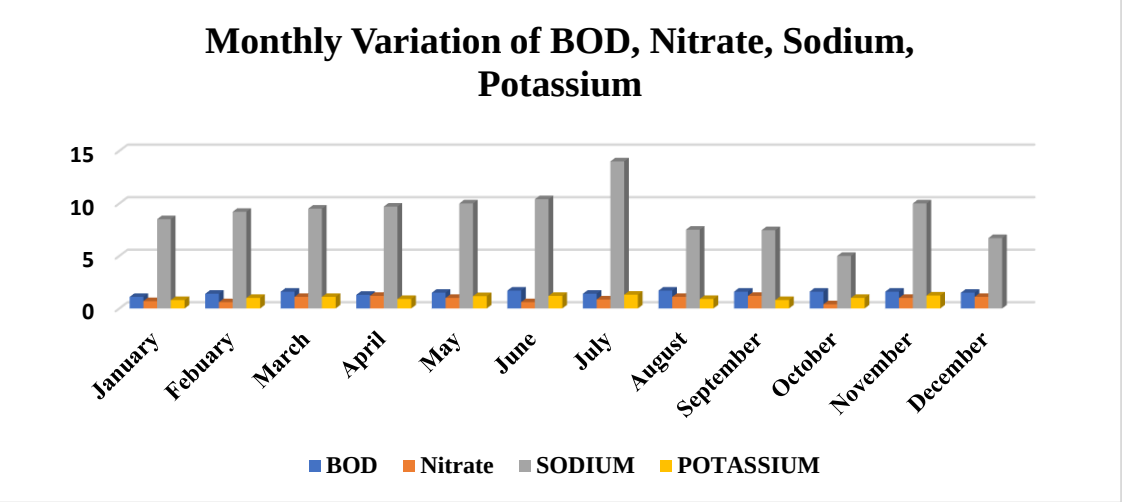
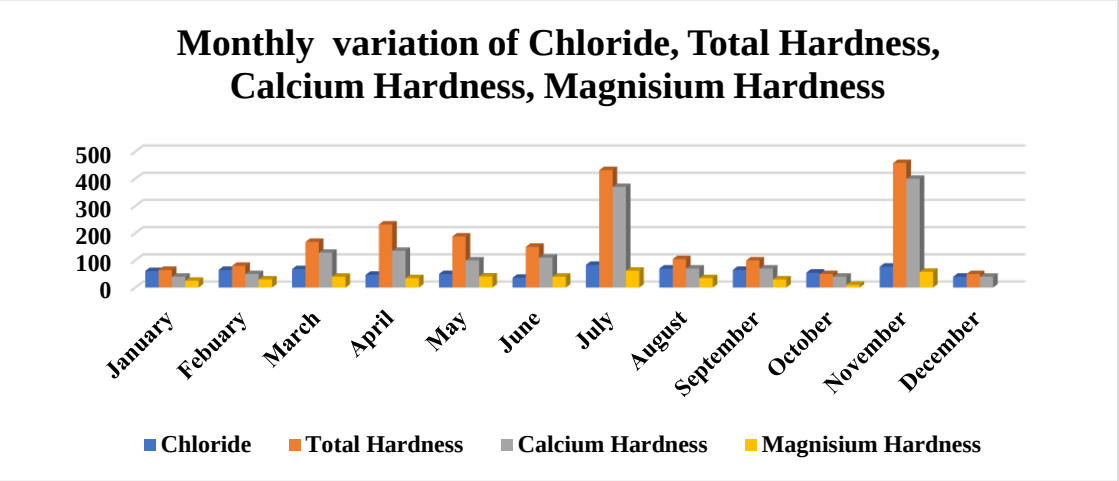
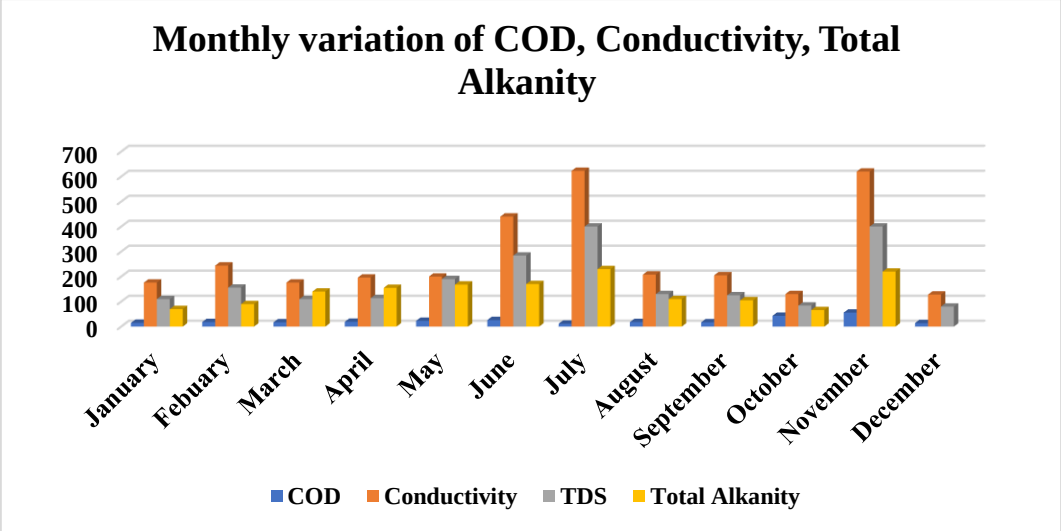

Monthly Variation of Temperature, Ph, Turbidity, Dissolved Oxygen
35
30
25
20
15
10
5
0
JANUARY
FEBUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
Temperature
Ph
Turbidity
Dissoloved Oxygen

Figure:1


Monthly Variation of BOD, Nitrate, Sodium, Potassium
15
10
5
0
January
Febuary
March
April
May
June
July
August
September
October
November
December
BOD
Nitrate
SODIUM
POTASSIUM


Monthly variation of Chloride, Total Hardness, Calcium Hardness, Magnisium Hardness
500
400
300
200
100
0
January
Febuary
March
April
May
June
July
August
September
October
November
December
Chloride
Total Hardness
Calcium Hardness
Magnisium Hardness



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References:

1. APHA (1975): Standard methods for the examination of water and waste water, Washington, (14th Ed.) Washington, D.C., U.S.A.
2. Boyd, C. E. (1981): Water Quality in warm water fish ponds. Auburn University. 359 Craftmaster printers, Ine. Oplika, Alabama.
3. Khinchi, P. J., Telkhade, P. M., Dahegaonkar, N. R. and Sawane, A. P. (2011): Effect of domestic activities on water quality parameters of river Irai, district Chanrapur, Maharahra. J. Sci. & Inf.,(3): 103-105.
4. Kumbhar, A. C. (2017): Physico chemical parameters of Ekrukh water reservoir of north Solapur Tahsil Solapur district (M. S.). Global Journal for Research Analysis,6(6): 224-226.
5. Kumari, S., Khan, J. A., Thakur, M. S. and Lal, H. (2019): Study of Physico-Chem-ical Characteristics of Water and Soil in Relations to Fish Production in Motia Lake Reservoir. J. Atmos Earth Sci.,2: 006
6. Mahor, R. K. (2011): Seasonal variation in different Physico-Chemical characteristics of water quality of fresh water reservoir tighra, Gwalior (M. P.). Life Science Bulletin,8(1): 126-128.
7. Phadke, S. V. and Raut, K. S. (2022): Comparative study of ground and well water quality in Latur Dist. Latur (M.S.) India. Journal of Emerging Technologies and Innovative Research, 9(6):700-706.
8. Tiwari, N. and Mahor, R. K. (2024): Hydrobiological study of Tighra Reservoir, Gwalior M. P. (India). International Journal for Multidisciplinary Research,6(4): 1-10.

9. Gaikwad, V. D., Padule, A. R. and More, R. B. (2021): Study of physicochemical parameters of Uttarmand Reservoir in Patan Tahsil, district Satara (M. S.) India. International Journal of Creative Research Thoughts,9(7): 188-190.
10. Sharma, D. K. (2015): Water quality analysis of the Tighra reservoir, Gwalior, Madhya Pradesh. Indian J. L. Sci.,5(1): 49-52.
11. Jagtap V. P., H. K. Bhagwan and S. M. Kamble, 2011. Studies on seasonal variation on physico-chemical characteristics of Sina-Kolegaon Reservoir in Osmanabad District, Maharashtra. Limnology Current Perspective (Ed. V.B. Sakhare) Daya Publishing House, Delhi pp.23-31.
12. Kadam M.S. ,D.V.Pampatwar and R. P. Mali, 2007. Seasonal variations in different physico-chemical characteristics in Masoli Reservoir of Parbhani District (MS) J.Aqua. Biol., (1) :110-112.
13. Sreenivasan A., 1968. Limnology of tropical impoundment of two hard water reservoirs in Madras state. Arch.Hydrobiol.65 : 205-222.
14. Swingle H. S., 1967. Standardization of chemical analysis of water and ponds muds. FAO Fish Rep. 44:337- 342.
15. Sharma Dushyant Kumar. 2006. Seasonal variations in certain physico-chemical characteristics in Makroda Reservoir of Guna District. Ecol. Envion. & Cons., (2): 201-204.